

Claims

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1. Method for the photometric analysis of test elements with a detection zone which is stable towards positioning tolerances of the detection zone comprising the steps
- a) placing a test element in a holder such that the detection zone of the test element is positioned relative to an illumination unit with at least one first and a second light source, a positioning tolerance of the detection zone occurring in at least one direction,
 - b) contacting a sample with the detection zone such that a detection system present in the detection zone leads to a photometrically detectable change in the detection zone when an analyte is present in the sample,
 - c) activating the first light source to irradiate a first region of the detection zone and detecting the light reflected from the detection zone or transmitted through the detection zone in order to generate a first detection signal,
 - d) activating the second light source to irradiate a second region of the detection zone which is displaced relative to the first region in the direction of the positioning tolerance and detecting the light reflected from the detection zone or transmitted through the detection zone in

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order to generate a second detection signal,

- e) comparing the first and the second detection signal and determining whether the first and/or the second detection signal has been obtained by illuminating an area situated completely on the detection zone and selecting the corresponding detection signal,
 - f) determining the analyte concentration contained in the sample by analysing the selected detection signal.
2. Method as claimed in claim 1, wherein the detection signal that has a lower intensity is selected.
 3. Method as claimed in claim 1, wherein appropriate steps are carried out in steps c) and d) before the detection zone is contacted with sample according to step b) in order to determine a first and a second base-line detection signal on an unused test element and wherein the first and the second detection signal are standardized by division by the corresponding base-line detection signal before determining the analyte concentration in step f).
 4. Method as claimed in claim 1, wherein the first region irradiated by the first light source and the second region irradiated by the second light source have essentially the same size.
 5. Method as claimed in claim 1, wherein the test element is a capillary gap test element.

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6. Method as claimed in claim 1, wherein the detection zone has a width X and the first and second light source are arranged such that a connecting line between the focal points of the regions irradiated by the light sources runs essentially parallel to the width.
7. Method as claimed in claims 5 and 6, wherein the width is arranged essentially perpendicular to the capillary gap.
8. Method as claimed in claims 1 or 5, wherein the region irradiated by the first light source and the region irradiated by the second light source are ovals.
9. Method as claimed in claims 1 or 5, wherein the region irradiated by the first light source and the region irradiated by the second light source are rectangles.
10. Method as claimed in claims 1, 8 or 9, wherein the first and second irradiated regions overlap.
11. Method as claimed in claim 10, wherein the maximum overlap is less than half the diameter of the irradiated regions.
12. Method as claimed in claim 1, wherein the detection zone has a width X and a connecting line between the first and second irradiated region is arranged essentially parallel to the width, the region irradiated by the first light source has a width d_1

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and the region irradiated by the second light source has a width d2 and the irradiated regions overlap over a maximum width "a" in the direction of the connecting line whereby the following applies:

$$d1 + d2 - a < X.$$

13. Method as claimed in claim 12, in which the following applies:

$$a < (d1 + d2) / 2.$$

14. Method as claimed in claim 1, wherein the illumination unit has at least one further light source which irradiates a third region and a change in the irradiation reflected or transmitted from the third region is detected in order to detect the presence of sample.

15. Method as claimed in claim 14, wherein the at least one additional light source emits radiation in a second wavelength range that is different from that of the at least two light sources and radiation transmitted or reflected in this second wavelength is detected in order to detect the presence of sample.

16. Method as claimed in claim 15, wherein the second wavelength range is in the range of 800 to 950 nm.

17. Method as claimed in claim 14, wherein the third region is located on the detection zone.

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18. Method as claimed in claim 17, wherein the sample is brought into flow contact with the detection zone and the third region is located downstream of the first and second region.

19. Device for the photometric analysis of test elements comprising:

- an illumination unit comprising at least a first and a second light source,
- a holder for holding a test element with a detection zone in such a manner that the detection zone is positioned relative to the illumination unit,
- a detection unit with at least one detector which detects light reflected from the detection zone or transmitted through the detection zone,
- a control unit which activates the first light source during a first activation phase in order to illuminate a first region of the detection zone and activates the second light source during a second activation phase in order to illuminate a second region of the detection zone and the signal generated by the detection unit during the first activation phase is recorded as the first detection signal and the signal generated during the second activation phase is recorded as the second detection signal,

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- an analytical unit which compares the first and second detection signal and determines whether the first and/or the second detection signal has been obtained by illuminating a region situated completely on the detection zone and a corresponding detection signal is analysed in order to determine the analyte concentration in the sample.
 - 20. Device as claimed in claim 19, wherein the illumination unit has at least one additional third light source which emits radiation in a second wavelength range that is different from the at least two light sources and radiation transmitted or reflected in this second wavelength range is detected.
 - 21. Device as claimed in claim 19, wherein the second wavelength range is 800 to 950 nm.
 - 22. Device as claimed in claim 19, wherein the third light source irradiates a region of the detection zone which does not overlap with the first and second illuminated region.
 - 23. Method for the photometric analysis of a test element with detection of sample application on a flat detection zone of the test element comprising the steps
 - irradiating a control region of the detection zone

- supplying sample liquid to the detection zone in such a manner that a first zone of the detection zone comes into contact with sample liquid earlier than a second zone which is laterally displaced from the first zone
- monitoring the radiation reflected from the control zone or transmitted through the control zone
- detecting presence of sample liquid in the control region as a result of a change of the reflected or transmitted radiation
- irradiation of at least one detection region of the detection zone
- detecting radiation which has been reflected from the detection region or transmitted through the detection region
- analysing the detected radiation to determine the concentration of an analyte in the sample liquid

wherein

a signal is generated when the presence of sample liquid is detected in the control region so that the supply of sample liquid can be terminated.

24. Method as claimed in claim 23, wherein the test element is a capillary gap test element.

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25. Method as claimed in claim 24, wherein the capillary gap runs below the detection zone.
26. Method as claimed in claim 23, wherein the detection region is nearer to the first zone than the control region.
27. Method as claimed in claim 23, wherein the control region is irradiated with radiation that is absorbed by the sample liquid.
28. Method as claimed in claims 23 or 27, wherein the detection region is irradiated with radiation that is essentially not absorbed by sample liquid.
29. Method as claimed in claim 23, wherein the signal is an optical and/or an acoustic signal.

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